Review Article

COSEPUP on Responsible Science

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A Review of Committee on Science, Engineering, and Public Policy, panel report, *Responsible Science: Ensuring the Integrity of the Research Process. Volume I*, Washington, DC: National Academy Press, 1992. xi + 199 pp. $24.95.

In a series of seven meetings held between May 1990 and June 1991, a 22-member panel convened by the Committee on Science, Engineering, and Public Policy, representing the National Academy Sciences (NAS), the National Academy of Engineering, and the Institute of Medicine, conducted a review of the "factors affecting the integrity of research and the research process as it is carried out in the United States today." (ix) *Responsible Science* Volume I presents the conclusions and recommendations of the panel. The reader interested in a clear and concise overview of the review study can read the Executive Summary, which does an outstanding job of describing the high points. Examined in more depth, the report can be divided into four sections: Chapter 1 introduces the goals and review process and discusses the definition of misconduct; Chapters 2 and 3 attempt to understand scientific misconduct in the broader context of scientific practice; Chapters 4 and 5 present a recent history of scientific misconduct; finally, Chapters 6 and 7 offer an action plan.

THE DEFINITION OF MISCONDUCT

One of the highlights of the panel report is the systematic and comprehensive discussion of the meaning of scientific and other misconduct. The panel established three categories relating to misconduct: misconduct in science (p. 27), questionable research practices (p. 28), and other misconduct (p. 29).

> Misconduct in science is defined as fabrication, falsification, or plagiarism, in proposing, performing, or reporting research. Misconduct in science does not include errors of judgment; errors in the recording, selection, or analysis of data; differences in opinions involving the interpretation of data; or misconduct unrelated to the research process.

Excluded (unanimously rejected) from the definition of misconduct in science was the phrase "and other serious deviations from accepted research practices,"

Biology and Philosophy **10:** 229–233, 1995.

which can be found in the definitions of misconduct used by the Public Health Service (PHS) and the National Science Foundation. On the other hand, by adding the clause about what misconduct does not include, the panel emphasized the importance of distinguishing misconduct from error and conflict, which are intrinsic to the scientific process.

"Questionable research practices" are those actions that "violate traditional values of the research enterprise and that may be detrimental to the research process." Such actions include maintaining inadequate research records, using inappropriate statistics, refusing peers reasonable access to materials or data, exploiting subordinates, and misrepresenting speculation as fact. The report emphasizes the need to clearly distinguish misconduct in science from questionable research practices, or as C. K. Gonsalus puts the matter, "to separate the crooks from the jerks" (Schachman, 1993).

"Other misconduct" refers to practices such as sexual harassment, misuse of funds, or violation of government regulations. The report points out the possibility that other misconduct will be "directly associated" with misconduct in science, for instance, reprisals against whistle-blowers or attempted cover-ups. Nevertheless, such actions are unacceptable in the broader institutional context and regulated by other statutes even when they occur in the course of doing science.

MISCONDUCT IN THE CONTEXT OF SCIENTIFIC PRACTICE

Unlike the systematic discussion of misconduct in Chapter 1, *Responsible Science* lacks coherence in its description in Chapter 2 of scientific principles and research practices. In part, the report excerpts a 1984 National Academy of Science statement to describe "The nature of science." (p. 38) The idealized view of the scientific method presented in this statement contrasts markedly with a more realistic analysis that makes it clear why "errors are an integral aspect of progress in attaining scientific knowledge." (p. 57) Moreover, the view in the 1984 NAS statement that "science accommodates, indeed welcomes, new discoveries" ignores the ambiguities in science that often result in outright hostility between scientists who don't believe each others discoveries. The frequency and intensity of such differences of opinion may be why the definition of misconduct in science specifically excludes "differences of opinion involving interpretation of data." (see above)

Conflicting views of science also are presented by a Richard Feynman 1974 commencement address: "...if you're doing an experiment, you should report everything that you think might make it invalid – not only what you think is right about it...(p. 37)" and historian Jan Sapp's more contemporary perspective: "What 'liberties' scientists are allowed in selecting positive data and omitting conflicting or "messy" data from their reports is not defined by any timeless method." (p. 39)

In contrast to the lack of clarity regarding scientific principles, Chapter 3 presents a clear account of recent changes in the research environment that

might influence the likelihood of scientific misconduct. These changes include greater competition for research funding, increased size of research teams, emphasis of the reward system on publications, and advent of the university-industry relationship.

RECENT HISTORY OF MISCONDUCT

Chapters 4 and 5 of *Responsible Science* present an excellent summary of the history of scientific misconduct from 1980 to 1990. Chapter 4 focuses on data about the incidence of misconduct. Chapter 5 concerns the institutional response to misconduct, particularly U.S. Government regulations and procedures. The discussion recognizes in a forthright manner that research institutions have had problems not only in responding to alleged cases of misconduct, but also in responding to criticisms of their record for handling allegations of misconduct. The panel concludes that "the number of confirmed cases of misconduct in science is low compared to the level of research activity in the United States" (p. 95), but emphasizes the seriousness of the misconduct problem even if misconduct occurs infrequently.

The reader should be aware that mechanisms for dealing with misconduct have evolved rapidly since the report was written. For instance, the Office of Scientific Integrity that had been located in the National Institutes of Health was combined with Office of Scientific Integrity Review and became the Office of Research Integrity (ORI) within the office of the Assistant Secretary for Health (NIH Revitalization Act of 1993). Moreover, there have been major procedural changes including addition of an appeals process involving the Health and Human Services Departmental Appeals Board. Recent action by the appeals board overturning an ORI conviction indicate that in the future a finding of misconduct should depend on intent to deceive, not just negligence (Anderson, 1994; Charrow, 1994).

RECOMMENDATIONS

The last two chapters of *Responsible Science* discuss what steps to take to encourage responsible research practices. A specific set of recommendations are put forth, three of which are particularly noteworthy. Recommendation #2 (p. 146) proposes that "Scientists and research institutions should integrate into their curricula educational programs that foster faculty and student awareness of concerns related to the integrity of the research process." Were this proposal made ten years ago, it would have been revolutionary. Coming two years after imposition of a PHS rule requiring such programs as part of PHS-supported predoctoral and postdoctoral training grants, the recommendation loses its novelty. Still, it represents an important expansion of the PHS rule to the entire academic community.

Recommendation #3 (p. 147) proposes optional "Adoption of formal guidelines for the conduct of research, which can provide a valuable opportunity for faculty and research institutions to clarify the nature of responsible research practices..." Much of Chapter 6 is devoted to discussing this possibility including a framework of subjects the guidelines should address: data management, publication practices, authorship, peer review, and training and supervision. The report points out that few institutions have developed such guidelines (e.g., 13% of medical schools) and discusses the disadvantages of such guidelines including the concern that they will encourage investigators to develop a "cookbook" approach to science. On the other hand, the report anticipates that such guidelines may be required in the future; better that they be developed internally than imposed from without.

Finally, recommendation #10 (p. 150) proposes creation of an independent Scientific Integrity Advisory Board. This advisory board would not only provide an information resource for the scientific community, but also would aim to increase public awareness about how the scientific research enterprise works. Although the panel did not address in detail the issue of public awareness of science, there was recognition that concern with misconduct is only one aspect of a broader public examination of the scientific enterprise. Clearly, the panel hopes that establishing a Scientific Integrity Board will help prevent erosion of public confidence in science, which might occur in response to the misconduct problem. The first task of the advisory board would be to identify the ethical issues that arise in the conduct of research.

CONCLUSION

There is a sentence in the first chapter of *Responsible Science* that, although not emphasized in any particular way, clearly sets out the problem for the scientific community.

> The selective use of research data is another area where the boundary between fabrication and creative insight may not be obvious. (p. 29)

What is needed is an articulation of scientific principles and research practices that makes it clear why science is the kind of activity where the boundary between fabrication and creative insight may not always be obvious. Anything less will undermine the capacity of science for creative insight. The inability of the panel to accomplish this task may explain in part why *Responsible Science* tends to focus more on what is wrong rather than what is right with the scientific enterprise. In the final analysis, one is inclined to concur with the minority statement that "the overall tone [of the report] presents an unbalanced treatment of scientists and institutions...[and] fails to convey the overriding importance of intellectual freedom and trust in a creative process that has been remarkably successful..." (p. 180)

REFERENCES

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Anderson, C.: "The aftermath of the Gallo case," *Science* 263: 20–22.
Charrow, R. P.: "A novice's guide to jurisprudence: Learning the law through ORI press releases," *J. NIH Research* 6: 64–66.z